

Reconfigurable Energy Harvesting Pixel

New transistor array architecture integrates image sensing and self-powering solar cell capabilities into camera pixels, enabling efficient, prolonged remote monitoring without external electrical infrastructure.

The use of cameras in remote environments is often limited to the camera's battery life. As a result, the extended use of cameras or image sensors in areas without existing electrical infrastructure requires an alternative energy source. This normally comes in the form of a small solar array; however, current systems are bulky, expensive, and overly complex. Fortunately, new options are being developed such as reconfiguring the pixels inside the detection system of the camera into solar cells. Regrettably, these reconfigured pixels do not adequately power the camera for prolonged periods.

Researchers at Purdue University have developed a transistor array that eliminates the resistance, or electrical inefficiency, normally associated with reconfigurable pixels. The reconfigurable pixel can function as a light-sensing element for image capture or as a tiny solar cell for energy harvesting. In this new pixel architecture, substrate photodiodes, which are considered as parasitic, are employed as energy harvesters. The pixel configuration is compatible with standard CMOS integrated circuit fabrication processes. Reconfigurable pixels could be applied in situations where a camera needs to collect data, but the location is not near an electrical infrastructure, e.g., border surveillance, highway monitoring, and habitat management.

Advantages:

- Functions as a light-sensing element for image capture
- Harvests energy for self-powering
- Transistors are arrayed in a more efficient manner
- The pixel architecture is compatible with CMOS integrated circuit fabrication processes

Potential Applications:

Technology ID

2015-LEON-67181

Category

Energy & Power Systems/Energy
Storage
Semiconductors/Devices &
Components
Robotics &
Automation/Perception &
Sensing

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Further information

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-Highway safety monitoring

-Border surveillance

-Habitat observation

-Remote monitoring

TRL: 2

Intellectual Property:

Provisional-Patent, 2016-07-14, United States | Utility Patent, 2017-07-14, United States | CON-Patent, 2019-07-16, United States

Keywords: Reconfigurable pixels, self-powering camera, energy harvesting image sensor, CMOS compatible pixel architecture, substrate photodiodes, border surveillance technology, highway monitoring camera, remote monitoring sensor, tiny solar cell pixel, electrical inefficiency elimination, Cameras, CMOS, Electrical Engineering, Energy Harvesting, Green Technology, Imaging, Photodiodes, Transistors